Claims

[c1] A method for tuning a laser, comprising the steps of:

positioning a gas cell containing gas with individual vibrational-rotation line spectra inside a tunable laser cavity having a resonance wavelength; and

employing a coarse wavelength tuning means to position the cavity resonance wavelength between adjacent absorption lines of said gas;

whereby said laser operates at an absorption minimum that occurs between said absorption lines;

whereby the laser wavelength is locked to an absolute wavelength defined by the gas;

whereby maximum absorption bands in said gas act as filters for laser wavelength output; and

whereby said laser does not require means for fine wavelength tuning.

[c2] The method of claim 1, further comprising the step of using an external tuning means to tune the laser to within a few nanometers of the minimum absorption wavelength so that it lases at the minimum spectral absorption lines where said laser cavity has maximum gain.

[c3] A method for tuning a laser that does not require means for fine wavelength tuning, comprising the steps of:

positioning a gas cell containing gas with individual vibrational-rotation line spectra outside a tunable laser cavity having a resonance wavelength; and

positioning the cavity resonance wavelength between adjacent absorption lines of said gas;

whereby said laser operates at an absorption minimum that occurs between said absorption lines; and
whereby the laser wavelength is locked to an absolute wavelength defined by the gas.

[c4] The method of claim 3, wherein the step of positioning the cavity resonance wavelength between adjacent absorption lines of said gas includes using coarse wavelength tuning means.

[c5] The method of claim 4, further comprising the step of using an external tuning means to tune the laser to within a few nanometers of the minimum absorption wavelength so that it lases at the minimum spectral absorption lines where said laser cavity has maximum gain.

[c6] A method for providing channel isolation at a receiver means in an open-path communication system, comprising the steps of:
providing a gas cell having gases therein selected from the group of gases including atmospheric gases and non-atmospheric gases, said gases having absorption lines;
providing a detector means in said receiver;
positioning said gas cell in said receiver upstream of said detector;
whereby unwanted light is pre-filtered;
whereby absorption lines in said gas provide wavelength control for laser wavelength and for the optical bandwidth of the receiver;
whereby channel isolation is provided at the receiver; and
whereby individual wavelength channels are formed between the absorption lines of said gases so that each channel is blocked by said

absorption lines from its adjacent channel.

[c7] The method of claim 6, further comprising the steps of:
providing said detector means in the form of a first and a second detector;
positioning a beam splitter between said gas cell and said beam splitter;
setting detector wavelengths for said first and second detectors to discrete wavelengths as defined by the gas in said gas cell;
whereby moderate bandwidth optical filters are used at a detector site because unwanted wavelengths are filtered out by the absorption characteristics of the gas in the gas cell.

[c8] The method of claim 7, further comprising the steps of:
positioning a first moderate bandwidth optical filter between said beam splitter and said first detector and positioning a second moderate bandwidth optical filter between said beam splitter and said second detector.

[c9] A method for providing channel isolation at a receiver means in an open-path communication system, comprising the steps of:
positioning a laser cavity resonance wavelength substantially mid-way between adjacent absorption lines of a preselected atmospheric gas;
providing a detector means in said receiver;
whereby absorption lines in said preselected atmospheric gas provide wavelength control for laser wavelength and for the optical bandwidth of the receiver; and
whereby channel isolation is provided at the receiver.

[c10] The method of claim 9, further comprising the steps of:
providing said detector means in the form of a first and a second detector;
positioning a beam splitter between said gas cell and said beam splitter;
setting detector wavelengths for said first and second detectors to discrete wavelengths as defined by the preselected atmospheric gas;
whereby moderate bandwidth optical filters are used at a detector site because unwanted wavelengths are filtered out by the absorption characteristics of the preselected atmospheric gas.

[c11] The method of claim 10, further comprising the steps of:
positioning a first moderate bandwidth optical filter between said beam splitter and said first detector and positioning a second moderate bandwidth optical filter between said beam splitter and said second detector;
tuning a laser source to within a few nanometers of the minimum absorption wavelength so that it lases at the minimum spectral absorption lines where said laser cavity has maximum gain.

[c12] A method for preventing cross-talk between adjacent wavelength channels, comprising the steps of:
controlling a wavelength-controlled laser to the optical bandwidth of a receiver means in an open-path communication system by tuning the laser so that it lases at minimum absorption wavelengths positioned between strong rotational-vibrational spectral absorption lines in atmospheric gases;

said strong absorption lines providing optical guard channels that prevent the cross-talk;
whereby an absorption line minimum locks the laser to the minimum absorption position and reliance upon optical bandwidth filters in a receiver channel is reduced.

[c13] A method for preventing cross-talk between adjacent wavelength channels, comprising the steps of:
providing a gas cell having atmospheric gases with strong absorption lines therein;
positioning said gas cell in a receiver upstream of a detector;
said strong absorption lines providing optical guard channels that prevent the cross-talk;
whereby an absorption line minimum locks the laser to the minimum absorption position; and
whereby reliance upon optical bandwidth filters in a receiver channel is reduced.